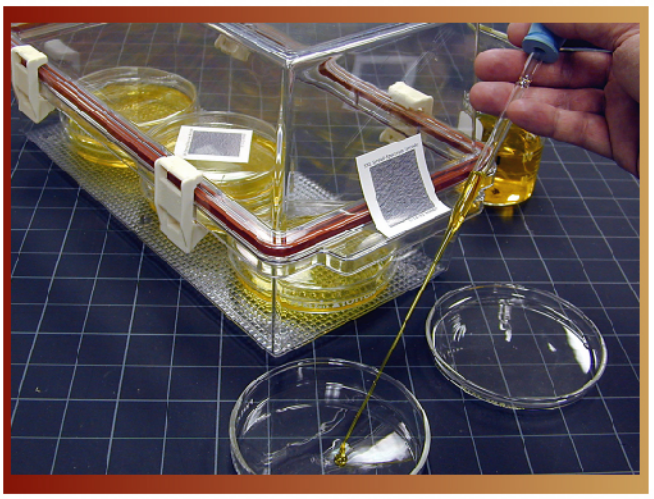
Beyond barcodes: An encoded pattern for tags, labels and seals that's stronger and more secure than 'bars'

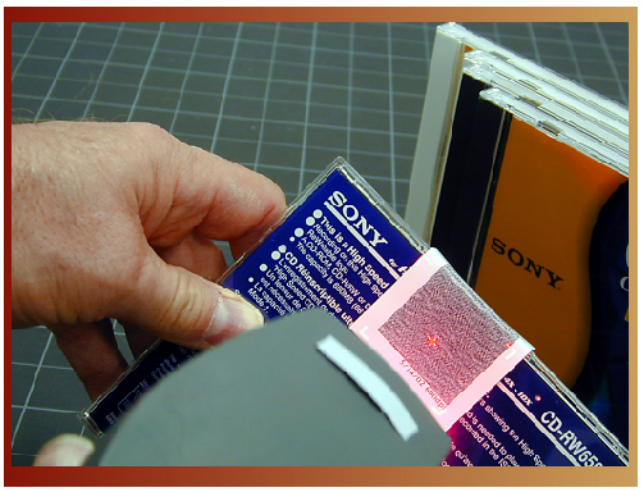
Fact Sheet

From smoke signals to semaphore flashes, shorthand coded sequences have long been as simple to telegraph as the long-short-long dashes of "SOS".

An affordable, convenient spread-spectrum code now offers added robustness or security. The mottled 2-dimensional swatch spreads information redundantly through a pseudo-random pattern, just like phone lines transmit across a spectrum to increase fidelity. Among its advantages: The "spread-spectrum" can only be rapidly read by someone who has the key to the pattern. It is damage-resistant, so that up to 70 percent of the area can be torn away or written over, but still readable with an average CCD camera.

Furthermore, no defined borders or fiducial registration are needed to read the code, which contains its own internal correction parameters for fidelity. The encrypted information is not only hard to access, but it can also be set with varying levels of access based on "need to know" for inventorying of sensitive materials. Likewise, the tag or seal is difficult to counterfeit. Since the speckled code may be printed in either shades or gray or color, it can be readily hidden inside a design or logo.





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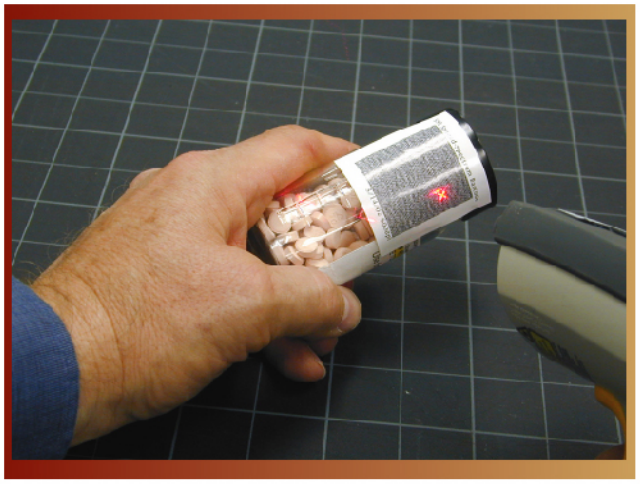
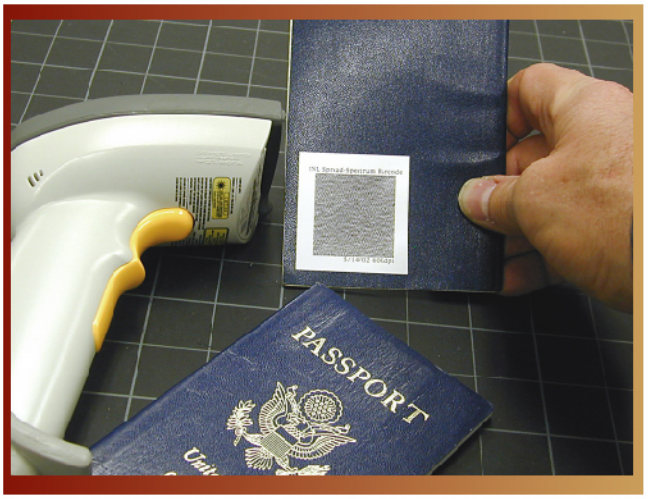
Finally, for highly secure, yet affordable, applications, the material can be printed with unique inks or coated with special gels containing self-assembling fluorescent particles that enhance authentication. After inventory, the coating can be re-set randomly for future authentication (in an impossible-to-predict but easy-to-verify way). If desired, the tag or seal can be designed to expire after a certain length of time, or to register elapsed time and temperature. As an added measure of security, this tag or seal can also reveal evidence of suspected tampering in an automated, quantitative fashion.





Specifications

- *Using PC software, encodes from 64 - 4096 bytes of data*
- *Printed on standard printer with no distinct border required*
- *One image can store multiple, independent data sets*
- *Data security is inherent in the barcode itself*
- *Can be scanned obliquely from any orientation with a digital or video camera*
- *Entire message is legible even if part is missing or obscured*

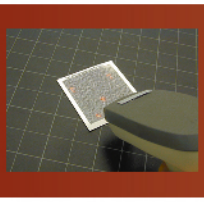
Envisioned applications include:

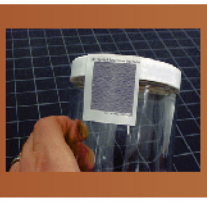
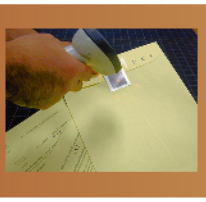
- *Retailing*
- *Warehousing*
- *Manufacturing*
- *Industrial safety*
- *Secure mail routing*
- *Private labeling*
- *Identity badges*
- *Mine safety*
- *Protection of currency, pharmaceuticals, precious resources or controlled materials*
- *Distortion detection and alignment for aerospace, optical targeting or evaluation*

Barcode size (grayscale pixels):	*Data capacity* (bytes) high to low damage tolerance:*	*Minimum barcode size (inches):*			*Minimum camera resolution (pixels):*
		300 dpi	*600 dpi*	*1200 dpi*	
128 x 128	*64 – 1024*	*1.7"*	*0.85"*	*0.43"*	*250,000*
256 x 256	*256 – 4,096*	*3.4"*	*1.7"*	*0.85"*	*500,000*
512 x 512	*1024 – 16,384*	*6.8"*	*3.4"*	*1.7"*	*2,000,000*
1024 x 1024	*4096 – 65,536*	*13"*	*6.8"*	*3.4"*	*4,000,000*

* *higher capacities are possible*

Like "spread-spectrum" telecommunications, the spread-spectrum barcode provides robust data transfer, even if a "noisy" environment poses decoding challenges


For information regarding possible collaboration towards commercialization or licensing opportunities, contact Scott Vaupen at (925) 294-2322, sbvaupe@sandia.gov. http://www.ca.sandia.gov/news/barcode

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